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Standards Support Document: Promulgated Amendments to the National Emission Standard for Asbestos

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Environmental Protection
Agency

Office of Air Quality
Planning and Standards
Research Triangle Park NC 27711

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16. ABSTRACT

The national emission standard for asbestos is being amended. Scientific information indicates that asbestos exposure can cause cancer and other adverse health effects. The amendments will reduce asbestos emissions by requiring that proper work practices be followed during the renovation and demolition of buildings where friable asbestos materials are present and by prohibiting the spray application of asbestos materials which would be friable after drying. A brief discussion of the economic and environmental impacts associated with these amendments is included in this document.

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Emission Standards and Engineering Division

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Waste Management
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

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Amendments to National Emission Standard
for Asbestos

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1. SUMMARY

On March 2, 1977 (42 FR 12121), the Environmental Protection Agency (EPA) proposed amendments to the national emission standard for asbestos under the authority of section 112 of the Clean Air Act. The Federal Register notice of proposed rulemaking requested public comments on the proposal. Twenty-four comment letters were received from manufacturers of asbestos products, demolition contractors, State air pollution control agencies, various Federal agencies, and other interested parties. The comments that were submitted along with EPA's responses to these comments are summarized in Chapter 2 of this document. This summary of comments serves as the basis for the revisions which have been made to the amendments between proposal and promulgation.

1.1 SUMMARY OF CHANGES SINCE PROPOSAL

The major change made since proposal is the development of an exemption for certain materials from the spraying restrictions in the proposed amendments to the asbestos standard. The proposed amendments would have prohibited the spray-on application of any material containing more than 1 percent asbestos on buildings and conduits. Also, no visible emissions would have been permitted from the spray-on application of materials containing more than 1 percent asbestos on equipment and machinery, and the intent to spray such materials would have had to be reported to EPA 20 days before spraying. The promulgated amendments provide an exemption from these restrictions for materials in which the asbestos fibers are encapsulated with a bituminous or resinous binder during spraying and which are not friable after drying.

1.2 SUMMARY OF ENVIRONMENTAL AND ECONOMIC IMPACTS

The promulgated amendments to the asbestos standard will have a significant beneficial environmental impact by reducing emissions of asbestos to the atmosphere. There will be minimal solid waste and water pollution impacts from the increased amount of friable asbestos materials which must be removed and disposed of in conjunction with demolition or renovation. No impact on national energy consumption is anticipated.

There is little difference in the environmental impacts of the proposed amendments and the promulgated amendments. The proposed amendments were intended to reduce asbestos emissions in two ways:

1. By requiring proper removal or stripping of all friable asbestos materials during demolition or renovation. As discussed in the preamble to the proposed amendments (42 FR 12121), decorative materials were not covered by the 1975 demolition and renovation provisions which applied to friable asbestos-containing fireproofing and insulation materials. Friable decorative materials, however, or for that matter any other friable asbestos-containing materials, would have as great a potential for releasing asbestos fibers to the air during demolition or renovation as asbestos-containing fireproofing and insulation materials. Therefore, the amendments were proposed to extend the demolition and renovation requirements to all friable asbestos materials.

2. By prohibiting the spray-on application of all materials containing more than 1 percent asbestos. This was intended to prevent the future use of friable asbestos-containing materials since these materials are likely to release asbestos during application, during their service life, and during demolition or renovation.

The promulgated amendments to the demolition and renovation provisions are the same as the proposed amendments. The spraying restrictions, however, have been changed. The wording, which was primarily intended to prevent the use of friable asbestos-containing decorative materials, was so broad in scope that it would also have prevented the use of asbestos-containing roofing products and other non-friable coatings in which the asbestos is well-bound both during and after application. As discussed in chapter 2, acceptable substitutes for the use of asbestos in bitiminous- and resin-based materials are not available and any beneficial environmental impacts resulting from the prohibition of this use of asbestos would be negligible. Therefore, the promulgated amendments exempt such materials from the spraying restrictions.

When these amendments were proposed, EPA invited all interested persons to participate in the rulemaking action by submitting factual information related to the proposed requirements during the comment period. Information concerning economic impacts which could result from implementing the proposed amendments was specifically requested. EPA received no comments which would indicate that any adverse economic impacts would result from prohibiting the spray application of friable asbestos-containing materials. Comments from the demolition industry did not address the possible economic impacts of the proposed amendments. Therefore, no significant economic impacts are expected to result from either the spraying provisions or the demolition and renovation requirements.

2. SUMMARY OF THE PUBLIC COMMENTS

The list of commenters and their affiliations is shown in Table 2-1. EPA received 24 letters commenting on the proposed amendments. The significant comments have been combined into the following major areas:

1. Spraying Restrictions
2. Demolition and Renovation Requirements
3. Test Methods and Monitoring
4. Health Effects
5. Miscellaneous

The comments and issues, along with EPA's responses, are discussed in the following sections of this chapter. A summary of the changes to the regulations is included in chapter 1.

2.1 SPRAYING RESTRICTIONS

The main issues raised by commenters on the spraying restrictions in section 61.22(e) of the proposed amendments involved exempting certain materials from the spraying restrictions and labeling asbestos-containing spray materials.

A number of commenters requested that EPA exempt bitumen- and resin-based asbestos-containing materials from the spraying restrictions in section 61.22(e) of the proposed amendments. Since the proposed amendments would have prohibited the spraying of all materials containing

more than 1 percent asbestos by weight, these materials would essentially have been banned by the proposal. Several commenters, however, reported that no acceptable substitutes are available for the asbestos fibers in these materials. Among the most likely substitutes which have been investigated are glass, cotton, wood, cellulose, mineral wool, hemp, and other types of inorganic and organic fibers; gelling and thickening agents; clay thickeners; including attapulgite; ground cork; styrofoam; ground rubber; vermiculite; feldspar; polyethylene fibrous powders; and ceramic fibers. Generally, these substitutes have been found to be unacceptable because of unsatisfactory durability; insufficient bulk; unsatisfactory qualities related to fibrous reinforcing, homogeneity, and adhesiveness; and agglomeration during spraying.

Materials with a bituminous or asphalt binder typically contain less than 15 percent asbestos and are primarily used as roofing compounds, for waterproofing of insulation exposed to the weather, and for automobile undercoating. Materials with a resinous binder typically contain less than 5 percent asbestos and are primarily used in marine and industrial maintenance applications to provide protection from damage due to water, chemicals, corrosion, weather, and other exposures.

The application of hot asphalt is a substitute for the spray-applied roofing compounds but is more expensive and is considered undesirable from an environmental and energy standpoint. In addition to being less effective than cold-process products, hot asphalt requires more energy for heating the compound and is a fire and safety hazard. Plastic or rubber membrane systems which are just coming into the marketplace are possible substitutes but currently have limited availability.

Prohibiting the spray application of asbestos-containing industrial maintenance materials would impose severe economic and energy impacts on

the industry. For example, a spraying ban on materials used to protect various forms of thermal insulation would decrease insulation effectiveness at industrial plants which use the products and increase energy consumption.

Further, the commenters submitted information to show that spray application of a non-friable material which contains a bituminous or resinous binder is unlikely to be a source of asbestos fiber emissions. Normally these materials are thixotropic (i.e., viscosity decreases as they are stirred or shaken). Consequently, before application, they are viscous and "sticky" or "tacky" and any asbestos fibers in the material are encapsulated and immobilized by the binder. During application, they take on an oily consistency and the spray equipment atomizes the material into droplets as it passes through the spray nozzle. The droplets vary in size according to the type of equipment used; but in all cases, the droplets are much larger than the individual asbestos fibers. The fibers do not become airborne during spraying because they are bound together by the binder in the material and encapsulated within these droplets which are too large to remain suspended in the air for any length of time.

The amount of binder necessary to encapsulate all the asbestos fibers which may be present is not the same for all materials. It varies with the amount of pigment, filler, and additives which are included. When just enough binder is present to completely fill the voids between these materials, the critical pigment volume concentration (CPVC) has been reached. If the CPVC is not exceeded, the binder is present in an amount sufficient to encapsulate the asbestos fibers in the coating. The CPVC will not be exceeded in any material which is

competitive in the marketplace. If the CPVC is exceeded, the material will not be durable and will not remain effective for an acceptable length of time because there is simply not enough binder to hold the components of the material together. Because the asbestos fibers in these materials are so firmly bound, non-friable bitumen- or resin-based spray materials which contain asbestos would not be a significant source of asbestos emissions during application, during their service life, or during demolition or renovation.

Because there do not appear to be acceptable substitutes available and any beneficial environmental impact resulting from the prohibition of this use of asbestos would be negligible, the spraying of materials in which asbestos fibers are encapsulated by a bituminous or resinous binder and which are not friable after drying is exempt from the provisions of section 61.22(e) of the promulgated amendments.

Data on the concentrations of asbestos measured during the spraying of bituminous- and resinous-based materials were submitted during the comment period. Asbestos concentrations measured during the spraying of asphalt cutback and emulsion roofing compounds containing from 3 to 15 percent showed levels from as low as 0.003 to as high as 0.6 fiber per cubic centimeter (f/cc). Measurements during tear-off of existing roofs comprised of asbestos-containing roofing felts and asbestos-containing asphalt materials showed levels as low as 0 to as high as 0.4 f/cc.

Other types of resin-based materials containing up to 37 percent asbestos, were also tested. Ambient air asbestos concentrations measured during spraying showed the following levels:

(a) 0 to 0.5 f/cc for weather-barrier mastics using asphalt, vinyl acetate, or vinyl or acrylic latex as a binder and containing from 1 1/2 to 37 percent asbestos.

(b) 0 to 0.2 f/cc for industrial materials using epoxy-coal tar as a binder and containing from 1/2 to 5 1/2 percent asbestos.

(c) 0 to 0.4 f/cc for materials using polyester or vinyl latex resins as binders and containing from 1 1/2 to 4 percent asbestos. Grinding and sanding of these materials after application showed levels from 0 to 0.4 f/cc.

These measurements were made in close proximity to the spraying operations, and are more representative of occupational exposure than exposure to the general public. As discussed above, the asbestos fibers in these materials do not become airborne during spraying, but are bound together by the binder in the material and encapsulated within droplets which are too large to remain suspended in the air for any length of time. Consequently, the airborne asbestos fiber concentrations to which the general public would be exposed would probably be at least one or two orders of magnitude lower than these levels.

To aid enforcement of the proposed spraying restrictions, some commenters suggested that materials should be labeled as to their asbestos content if they contain in excess of 1 percent asbestos by dry weight and have the potential for spray-on application. Requiring labeling would constitute a significant change in the amendments and would require reproposal. Rather than reproposing, the need for such a provision will be assessed during the enforcement of the amendment. Based on this assessment, additional amendments may be proposed to require labeling at some future date.

2.2 DEMOLITION AND RENOVATION REQUIREMENTS

Although several issues concerning the demolition and renovation requirements were raised during the comment period, most did not deal specifically with the proposed amendment. One commenter, for example, questioned EPA's authority to establish work practice rules rather than emission standards to control hazardous air pollutants. The same commenter

suggested that EPA has never had a factual basis for considering the demolition of buildings not containing sprayed asbestos fireproofing as a "major" source of asbestos emissions and requested that EPA monitor ambient air in the vicinity of representative mechanical demolitions to determine asbestos emissions. Other commenters, however, stated that the extension of the demolition and renovation provisions to all friable asbestos material is warranted and that renovation or demolition will in time constitute the most significant emission source of asbestos fibers to the atmosphere.

The demolition and renovation regulation requires certain work procedures to be followed. These methods of control are required because of the impossibility of prescribing and enforcing allowable numerical concentrations or mass emission limitations. There is no way to measure the total emissions from a demolition or renovation operation since these operations are not enclosed and emissions are not directed through one or more specific points or smoke stacks.

In the 1977 amendments to the Clean Air Act, section 112(e)(i) states, "...if in the judgment of the Administrator, it is not feasible to prescribe or enforce an emission standard for control of a hazardous air pollutant or pollutants, he may instead promulgate a design, equipment, work practice, or operational standard, or combination thereof, which in his judgment is adequate to protect the public health from such pollutant or pollutants with an ample margin of safety." This provision clarifies the intent of section 112 by specifically including the prescription of work practices as a legal alternative to a numerical emission standard. It reaffirms EPA's original interpretation of section 112 as stated in the preamble to the 1975 amendments to the demolition and renovation provisions (40 FR 48291): "Congress has specified that EPA should set emission standards

for hazardous air pollutants. EPA, charged with implementing this requirement, has determined that the term 'emission standard' includes work practice requirements designed to limit emissions." The prescription of work practices is therefore not only a legally permissible form of an emission standard, but also the only practical and reasonable form.

In the preamble to the 1975 amendments (40 FR 48291), the determination that demolition of buildings containing friable asbestos fireproofing or insulation was a major source of asbestos emissions was discussed. Other types of asbestos materials besides fireproofing and insulation are friable and would thus constitute a source of asbestos emissions during demolition or renovation. Therefore, buildings containing any friable asbestos materials are covered by the promulgated amendments.

Two commenters requested that the definition of "friable asbestos material" be amended because it is inadequate. The suggestion was made that it specify an ASTM test method by which the friable nature of a material can be determined with accuracy and uniformity.

The American Society for Testing and Materials (ASTM) has indicated its intention to develop a test method for friability of asbestos-containing materials. The test method will be evaluated when it is developed and consideration given to incorporating it into the asbestos standard.

The current definition of "friable asbestos material" is sufficiently clear that owners or operators subject to the regulation can easily understand the term. The term is defined in such a way that a simple on-site test can be used to determine the applicability of the regulation. It is only necessary to apply hand pressure to a sample of the material to see if it can be crumbled, pulverized, or reduced to powder.

One commenter suggested that the regulation be extended to require removal of existing asbestos-containing sprayed materials which present

significant risks to human health due to deterioration, particularly in buildings accessible to the public. The proposed amendments would have only prohibited the future application of asbestos-containing spray material.

This problem is being addressed through the preparation of a guidance document which will assist governmental agencies and private individuals who must decide on proper action to take when sprayed asbestos materials are found in existing buildings. The first volume of the document discusses criteria for determining whether asbestos material in a building is a problem; the current knowledge of hazards from spray-on asbestos in buildings; and alternative corrective actions that may be taken, including acceptable removal procedures and the use of sealants for coating the material. Available information on sealant types will be discussed and a preliminary list of desirable properties for effective sealants will be included. Very little data are currently available for various sealants; therefore, this document will only contain minimal guidance concerning the use of these products. The second volume of the document, which is scheduled to be available in later 1978, will present the results of studies which will be done on sealants to determine their effectiveness and acceptability for coating asbestos materials. As soon as each volume is published, copies will be provided to State and local governmental agencies and other interested parties. Copies of the first volume of this document may be obtained upon written request from the Emission Standards and Engineering Division (MD-13), Environmental Protection Agency, Research Triangle Park, North Carolina 27711 (specify Sprayed Asbestos-Containing Materials in Buildings: A Guidance Document).

One commenter requested that the renovation, modification, and dismantling of process equipment at industrial facilities be exempted

from the demolition and renovation requirements since OSHA regulations prescribe procedures which provide adequate safeguards to prevent excessive airborne asbestos emissions.

The OSHA regulations are designed mainly to protect the worker's health and therefore allow certain practices that result in emissions of asbestos to the atmosphere. Workers are required to take special precautions, such as wearing respiratory equipment and special clothing during renovation or demolition, if asbestos emissions are likely to exceed the level of the standard. Thus, the purpose of the OSHA standard to protect employees' health can be achieved by measures such as the use of respiratory equipment, even when emissions may produce concentrations in excess of the OSHA exposure limit. Therefore, the demolition and renovation requirements in section 61.22(d) of the standard remain in effect for OSHA-regulated industries in order to reduce asbestos emissions to the ambient air to which the general public is exposed.

2.3 TEST METHODS/MONITORING

The lack of EPA reference methods for making various asbestos measurements was of concern to some commenters. Specifically, they suggested that EPA publish a method for determining the percentage of asbestos in spray materials and reference OSHA-NIOSH procedures for measuring airborne asbestos particulate matter from spraying operations.

There are a number of methods, based on electron microscopy, which have been developed by independent laboratories for determining the percentage of asbestos in materials. Laboratories that perform asbestos analyses using these methods generally have reasonable internal consistency. Inter-laboratory comparisons, however, have shown that the results obtained by separate laboratories are often widely different. In mid-1977, a

laboratory crosswalk study was conducted in which ambient air samples of the same asbestos-containing materials were sent to different laboratories for analysis by electron microscopy. The results showed a range of four orders of magnitude for laboratories using different procedures. This experiment indicates that extremely wide variability in results can be expected between laboratories. Part of the problem is that even the same measurement principle is used, each laboratory has different sub-procedures that are followed.

In an attempt to standardize procedures and reduce this variability, a provisional electron microscope procedure for measuring the concentration of asbestos in air samples has been developed. This procedure can also be used for material samples although it is recognized that the provisional procedure may have to be modified for various applications. Statistical analysis was used to evaluate the effects of the many interacting sub-procedures and arrive at an optimum composite procedure. This procedure is expected to reduce the expected variability in results among laboratories to the range of 40 to 60 percent. It will be further evaluated for use in actual field studies and if found acceptable, may eventually serve as the basis for an EPA reference method. The procedure is available in a publication entitled Electron Microscope Measurement of Airborne Asbestos Concentrations: A Provisional Methodology Manual, EPA 600/2-77-178, August, 1977. Copies of this document may be obtained upon written request from the Environmental Sciences Research Laboratory (MD-49), Environmental Protection Agency, Research Triangle Park, North Carolina 27711.

The OSHA-NIOSH method measures airborne asbestos fiber concentrations by phase contrast microscopy. It measures only those fibers that are longer than 5 microns and does not differentiate between asbestos and

other fibers. While such a method may be sufficient for enforcing the OSHA workplace asbestos standard, it is not sufficient as an indicator of total asbestos concentration in the ambient air. Many asbestos fibers are smaller than the smallest measured by the OSHA-NIOSH method and these fibers may contribute significantly to the total amount of asbestos which may be present in the ambient air. The provisional electron microscope method described above is useful for estimating airborne asbestos fiber concentrations with greater precision.

2.4 HEALTH EFFECTS

Some commenters suggested that since asbestos is a carcinogen and a threshold level for health effects has not been established, the 1 percent allowable asbestos content for spray material permits too much environmental contamination and should be lowered considerably, if not completely eliminated. The 1 percent allowable content of asbestos was selected primarily to allow the spray application of materials which contain trace amounts of asbestos which occur in numerous natural substances and which could not be reduced or removed from these materials without effectively banning their use.

2.5 MISCELLANEOUS

There were a number of minor questions, requests for clarification, and suggestions made by the commenters. Several questions were raised regarding the intent and applicability of various parts of the regulation. Commenters specifically questioned the applicability of section 61.22(e) with respect to the meaning of the terms "structures," "structural members," "pipes," "conduits," and "equipment and machinery," and suggested that definitions for these terms be included in section 61.21.

The term "structure" is part of the definition of "stationary source" in section 61.02(p): "'Stationary source' means any building, structure, facility, or installation which emits or may emit any air pollutant which has been designated as hazardous by the Administrator." The term "structural member" is defined in section 61.21(x) which was promulgated on March 2, 1977 (41 FR 12124): "'Structural member" means any load-supporting member, such as beams and load-supporting walls; or any non-load-supporting member, such as ceilings and non-load-supporting walls." The terms "pipes," "conduits," and "equipment and machinery" are used in the general sense and, therefore, their meanings are self-evident. The question was raised as to whether the term "equipment and machinery" applies only to stationary equipment and machinery or would include such machinery as automobiles. The term applies to all equipment and machinery, whether mobile or stationary. It is important to make it clear at this point, however, that under section 61.22(e) the source being regulated is not the object being sprayed; rather, it is the spraying operation itself.

Under the proposed amendment to section 61.22(e), the spray application of asbestos-containing automobile undercoating and sound deadeners would have been covered. The promulgated amendment exempts such applications, however, since undercoating and sound deadeners are bitumen-based and are non-friable after drying, as discussed in section 2.1.

One commenter suggested that references to "institutional, commercial, or industrial" buildings should be eliminated in Subpart B to prevent opportunities for future loopholes to be uncovered in the applicability of the standard. This limitation on the types of buildings covered by the demolition and renovation regulation was discussed in the preamble to the asbestos standard promulgated on April 6, 1973 (38 FR 8821). The coverage at that time was based on

the National Academy of Sciences' (NAS) report[1] which states, "In general, single-family residential structures contain only small amounts of asbestos insulation. Demolition of industrial and commercial buildings that have been fireproofed with asbestos-containing materials will prove to be an emission source in the future, requiring control measures." The NAS report referred specifically to asbestos fireproofing and insulation, and those were the only types of asbestos-containing materials covered by the 1973 standard. There is no information which would indicate that other types of friable asbestos materials would be present in single-family residential structures to such a degree that asbestos emissions would be significant during renovation or demolition. Therefore, the applicability of the demolition and renovation requirements of the standard has not been revised other than extending the coverage to all friable asbestos materials.

[1] National Academy of Sciences: Asbestos (The Need for and Feasibility of Air Pollution Control). Washington, National Academy of Sciences, 1971, 40 pp.

Table 2-1

List of Commenters on the Proposed Amendments to the Asbestos Standard

March 2, 1977 (42 FR 12121)

Commenter	Affiliation
Edward E. Reich	DSSE - EPA
W. H. Mortonson	Flintkote Building Products
J. C. Winkley	C F & I Steel Corporation
Eric S. Wormser	Gibson-Homans Company
Jon C. Root	Southwest Grease & Oil Co. (Kansas City), Inc.
J. H. Macpherson	Chevron Research Company
Leo J. Spillane	Gulf States Asphalt Co., Inc.
Irving J. Selikoff, M.D.	Mt. Sinai School of Medicine
Raymond J. Connor	National Paint and Coatings Association
Paul H. Arbesman	N.J. Department of Environmental Protection
Richard P. Carter	Johns-Manville Sales Corporation
W. P. Ellis	H.B. Fuller Company
Burton Y. Weitzenfeld and Stanley M. Lipnick	Attorneys for National Association of Demolition Contractors, Inc.
J. A. Bierbaum	Lion Oil Company
Joseph T. Mooney, Jr.	Monsey Products Co.
Andrew E. Kauders	General Services Administration
H. J. Holloway	GAF Corporation
Robert H. Mereness	Asbestos Information Association
F. D. Dennstedt	Exxon Company, U.S.A.
Edwin W. Abbott	Air Transport Association of America
V. L. Lawson	Texas Refinery Corporation
Heather L. Ross	U.S. Department of the Interior
J. R. West	Koppers Company, Inc.
David M. Benforado	3M Company